



Joshua Lederberg

1-25-69

Food Needs Require Us To Apply Basic Biology

GENETIC engineering, in the form of domestication of wheat and other crop plants, impelled the earliest steps towards the civilization of the earth. The impending saturation of the planet's resources by an explosively growing human population will not be averted merely by further technological devices. We face even more baffling problems of social organization to govern the allocation of the world's tasks and goods. We can, however, make sure that the population growth is stemmed sooner by mass starvation than by voluntary regulation if we neglect to nurture and use our expertise in fundamental biology in support of agriculture's race to keep up with more mouths.

OUR FAULTS in the transformation of basic to applied biology are for the moment obscured by America's parochial and transient problem of crop surpluses, and by the isolated but important successes (like IR-8 dwarf rice) that stand to the credit of contemporary plant breeding work. It must also be noted that many scattered improvements in crops yield must be attributed to unreliably good weather and to the long-belated introduction of chemical fertilizers. The fertilizers and the current new breeds rest solidly on the basic science of 30 to 40 years ago.

Botanists are well aware of their unfulfilled responsibilities. They also perceive internal problems derived from the segregation of

plant breeding departments in universities.

Prof. Sherret S. Chase of Harvard's Botanical Museum points out, in an article in the *Bulletin of the Atomic Scientists*, that too often "these departments are subservient to the specialized interests of the existing staff, the local economy and the local policy. Too little attention is paid to the concentration and consolidation of plant breeding knowledge; toward synthesis and internal criticism; too little effort is directed toward fundamental research."

He pleads persuasively for "a broadly oriented, international plant breeding center, charged directly and specifically with the task of furthering the art and science of plant breeding throughout the world and with the upgrading of the plant breeding profession."

PLANT CELL biology is nonetheless the scene of some exciting new advances. A recent issue of *Science* magazine reported a finding that individual pollen grains (from tobacco plants) could be cultured on special media, sprouting eventually into whole, intact plants. Since the pollen grain normally functions to fertilize the plant egg, it has a chromosome count only half that of the parent plant. The finding has important potentials for greatly speeding up the production and testing of pure lines and will undoubtedly become an indispensable technique (after another 40 years?) in the development of new crops.

The French authors of

this work were evidently unaware of some earlier studies. (In fact, with the help of modern bibliographic tools not yet widely enough available, I quickly discovered that the fundamental discovery of this kind had been made in 1964 by Drs. Sipra Guha and S.C. Maheshwari in New Delhi (reported in *Nature* magazine). Furthermore, H. Niizeki and K. Oono of the Agricultural Science Institute at Hiratsuka had reported to the Japan Academy last summer their successful production of rice by the same method.)

The French workers, J.P. and C. Nitsch, must nevertheless be credited with great improvements in the efficiency of the method. All in all, this example illustrates the need for the kind of focus and improved communication in a subject having high priority of world interest that Prof. Chase demanded.

THE OUTGROWTH of pollen into a complete plant is also of great interest to general biology, for it shows that the plant egg carries no structures or information indispensable to the full growth and development of the offspring. The DNA of the pollen grain nucleus is enough—perhaps together with any structures are also regularly transmitted by pollen grains, despite the fact that these normally pass a male nucleus to the egg and do little else. The parallel question for eggs and sperm of higher animals remains open, but we are one step closer to a general answer.

© 1969. The Washington Post Co.